



Examining Challenges in Achieving Open Defecation Free Status in Central Mamberamo and Jayapura Districts, Papua, Indonesia

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Abstract. Open defecation negatively impacts many aspects of life, including environmental quality, water pollution, and the emergence of various diseases. Indonesia is one of 61 countries with a high burden of open defecation, with Papua having the lowest sanitation index. The objective of this research was to gain deep understanding on the challenges associated with altering open defecation behaviors in two regions within Papua, specifically Central Mamberamo and Jayapura districts. This study used both a quantitative and qualitative approach. Structured interviews were used to collect quantitative data from 367 households in Jayapura District and 232 households in Mamberamo Tengah District. Meanwhile, in-depth interviews, focus group discussions, and observations were used to collect qualitative data. Ownership of latrines was relatively high in both districts. However, the problems surrounding access and availability of clean water were still a polemic that must be considered. In addition, many latrines were not suitable for use because they were damaged or not built according to standards. In general, public awareness regarding sanitation was still relatively low resulting in the community's defecation habits. Supporting factors for stopping open defecation programs included customary rules on water use, support from religious and community leaders, and community perceptions regarding the health impacts that arise. However, there were still challenges related to socio-economic factors and the lack of government assistance to provide healthy latrines. Reaffirming current laws and policies is necessary. Community involvement in government programs related to efforts to stop open defecation is essential. This may have effects on how programs are accepted and how they are adapted to fit with local customs and values. Additionally, interventions to raise public awareness of open defecation must be implemented.

Keywords: open defecation, behavior, enabler, challenges

1 Introduction

Sanitation provides significant benefits for public health and the environment. Poor sanitation has caused diarrhea and other feces-related diseases. At the same time, good sanitation not only improves health levels but can also positively impact the economic and social sectors [1]. Because of the importance of sanitation, sanitation has become a new target set in the Sustainable Development Goals (SDGs) to ensure the availability and sustainable management of water and sanitation for all by 2030, which poses many challenges for developing countries, especially Indonesia[2]. Based on the WHO report on sanitation, in 2017, there were still 673 million people who practiced open defecation in several countries, 18% by rural residents and 1% by urban residents [3]. Indonesia is one of 61 countries with a high burden of open defecation; more than 5% of the population practiced open defecation in 2017 [3].

The Indonesian Statistical Bureau reported that 77.4% of Indonesian households have adequate sanitation facilities[4], which is still far from 90% target of the 2015-2019 National Medium Term Development Plan [5]. The 2019 Central Bureau of Statistics report also stated that more access to basic sanitation facilities and services was needed in Indonesia. Several areas, such as Yogyakarta, Bali, and DKI Jakarta, have achieved more than 90% for proper sanitation, but Papua still needs to catch up, as only 38.27% of its population has access to basic sanitation services and facilities [4].

According to the sanitation index value, Papua is the province with the lowest sanitation index score in Indonesia[6]. Around 15.45% of households in Papua do not have proper toilet facilities [6]. This situation is a problem and could lead to open defecation practices.

Open defecation will harm various aspects of life, including the emergence of various diseases such as cholera, typhoid, diarrhea, worms, hepatitis, and skin diseases [7]. In 2017, approximately 827,000 people in developing countries died due to inadequate water sanitation, and hygiene [8]. Approximately 54-65% of diarrhea deaths in low-income countries are caused by inadequate drinking water (35%), sanitation (31%), and environmental cleanliness [8].

The Public Health Development Index Book shows that the score in 2018 for Papua Province was ranked at the bottom of all provinces in Indonesia [9]. This ranking has remained the same in the period of 2013-2018. The book also states that Mamberamo Regency is one of ten districts that need special attention to improve health. The Community Health Development Index was built from 30 indicators using 2018 Basic Health Research data sources. Even though it is still in the lowest position in Indonesia, the IPKM value for Papua Province has experienced a slight increase, namely from 0.4387 in 2013 to 0.4888 in 2018 [9]. From the overall increase that occurred in Papua, there was a significant increase in the sub-indices of infectious diseases and environmental health [10]. Of the indicators that are in a bad condition, there are at least seven indicators related to environmental health problems and environmental-based diseases, namely washing hands properly, access to sanitation, access to clean water, prevalence of dental and oral diseases, pneumonia, urinary tract infections, upper respiratory tract infection (UTRI) and diarrhea [10].

The issue of open defecation in Papua is still a complicated problem that must be addressed. Various efforts in the form of policies, programs, triggers, interventions, and even the imposition of fines have been made to prevent this behavior. However, this problem has not gone away. There is a ‘missing link’ where the approaches that have been used so far are deemed less effective. The various approaches taken so far – apart from efforts to provide infrastructure and policies – are efforts to change community behavior. Behavior itself is all an individual’s biological manifestations in interacting with the environment, both visible and invisible behavior, from what is felt to what is not felt [11]. Behavior is greatly influenced by an individual’s knowledge of something, as well as the values and norms that apply where the individual lives. In this study, we believe that it is paramount to understand the values and cultural norms pertaining to defecation practices and determine whether these societal values and norms serve as hindrances or facilitators in the pursuit of achieving open defecation-free status in the Central Mamberamo and Jayapura district.

2 Methods

This research is a combination of qualitative and quantitative data collection methods, which include in-depth interviews, document review, questionnaire surveys, and physical observations of toilets. Quantitative and qualitative data were gathered almost at the same time over a span of four weeks during July - August 2022. Quantitative data collection was carried out by giving questionnaires to all respondents. The respondents for quantitative research were 367 families from Jayapura District and 232 families from Central Mamberamo District. The sample criteria, namely households domiciled in Kobagma Village and Sentani City according to population status, must be over 15 years old by the time the survey was conducted. Qualitative data collection was carried out using in-depth interviews, observation, and focus group discussions (FGD). Informants were representatives of village officials, community leaders, religious leaders, sanitarians from the local public health clinics, and local NGO representatives. This study has obtained an ethical approval from the Health Research Ethic Committee of Health Polytechnic of Jayapura, number 026/KEPK-J/V/2022.

3 Results

3.1 In the context of Sanitation

Sanitation is deliberate behavior in cultivating clean living to prevent humans from coming into direct contact with dirt and other dangerous waste materials in the hope that this effort will maintain and improve human health [12]. The definition of environmental sanitation is the health status of an environment, which includes housing, dirt removal, provision of clean water and so on [13]. Environmental sanitation is an effort to achieve a healthy environment by controlling physical environmental factors, especially things that harm the physical development of human health and survival.

Environmental sanitation has the most important position in everyday life because it affects the health of individuals and society. Environmental sanitation can reflect the way of life of a community. To obtain good environmental sanitation conditions it really depends on the procedures and behavior of the community in maintaining the quality of environmental sanitation. Sanitation is one component of environmental health, namely intentional behavior to cultivate a culture of clean living to prevent humans from coming into direct contact with dirt and other dangerous waste materials, hoping to maintain and improve human health [14].

Basic sanitation includes providing facilities and services for the safe disposal of human waste, maintaining clean and hygienic conditions, and promoting good health practices related to personal and environmental cleanliness. Proper sanitation is crucial for preventing the spread of diseases and improving overall public health. It includes the safe disposal of human waste, access to clean water, and hygiene practices. Open Defecation-Free (ODF) is a status achieved when a community, village, or region successfully eliminates open defecation, meaning that all individuals and households use improved sanitation facilities such as latrines or toilets instead of defecating in open areas like fields, bushes, or water bodies. Achieving ODF status is a significant milestone in improving sanitation and public health. It reduces the risk of water contamination and the spread of diseases and enhances overall community well-being. WHO stated that the population practicing open defecation is defined as the proportion of the population who are not utilising any toilet facility for defecation. Those using unimproved sanitation facilities like pit latrines without a slab, open pit, or hanging latrines are not counted as practicing open defecation.

This research finds that 21.5% and 22.4% of respondents in Jayapura and Central Mamberamo don't own private latrines in their home. Promoting latrine ownership is often a key strategy in the context of efforts to improve sanitation and achieve ODF status. Communities and governments work together to ensure that households have access to sanitary latrine facilities, which, in turn, contributes to better overall sanitation and public health outcomes. Most homes were privately owned, with 23.9% and 14.2% of respondents in Jayapura and Mamberamo sharing their house with more than 8 persons.

One important thing to highlight is the issue of access to clean water source. Respondents in Jayapura District have more access to a variety of sources of clean water. Whereas 80.6% of respondents in Central Mamberamo District can only depend on rainwater for daily needs, including hygiene. Access to clean water is closely linked to proper sanitation and hygiene practices. Activities like handwashing, food preparation, and sanitation facilities need to be in place to prevent waterborne diseases.

Table 1. Homeownership, Density, Water Source and Latrine Ownership in Jayapura and Central Mamberamo District

Variables	Jayapura		Central Mamberamo	
	n	%	n	%
Home ownership				
Own	301	82	198	85.3

Variables	Jayapura		Central Mamberamo	
	n	%	n	%
Family	52	14.2	11	4.7
Rent	11	3	1	0.4
Company/state own	3	0.8	22	9.5
Home density (how many persons in the house)				
1 - 4 persons	123	33.5	74	31.9
5 - 8 persons	156	42.6	125	53.9
more than 8	88	23.9	33	14.2
Source of clean water				
Rainwater	7	1.9	187	80.6
Lake or reservoir	91	24.8	0	0
Dig well	2	0.5	0	0
Drilled well	133	36.2	0	0
River	19	5.2	25	10.8
PDAM	115	31.4	20	8.6
Latrine Ownership				
Have Latrine	288	78.5	180	77.6
Don't Have Latrine	79	21.5	52	22.4

Various efforts have been made to achieve cleanliness and public health. It does not only involve the role of government but also the community to work together. City and regional governments continue to implement steps and policies related to drinking water and sanitation to fully support the sanitation movement. The scarcity of clean water means that many people in Papua Province still consume drinking water directly from water sources even though the water source has been contaminated with *Escherichia Coli* bacteria due to the existing open defecation practices in the area [15].

To meet the daily need for clean water, the community collects rainwater and/or depends entirely on river water. There are those who try to catch rainwater in the reservoirs they own, and there are also those who take it directly from the river. However, this only applies to those who live close to and far from the river. Traditionally, people guard rivers and highly depend on and respect water. For example, they divide rivers based on gender. Namely the adult male river area or area and the female river area. The river area for use by men is usually located at the top and women at the bottom. They also make traditional water reservoirs made from dried large pumpkins. The mothers also shared how they would store clean water in these containers. When we asked because, for example, if children drink milk or for consumption by the elderly or sick, they need clean water, they said they would usually tamp it or store it in a special container. However, several informants in this research stated they say they drink it more often without cooking it first. This aligns with several epidemiological investigations pertaining to health conditions in Papua, where the etiology is attributed to the consumption of untreated drinking water [16].

Another note regarding the provision of clean water is that the government has started building pipe installations to distribute clean water, but there is a problem where the community is damaging the pipe flow. Several civil servants we interviewed conveyed this. However, the lesson was that it would be better if in the process of working on large-scale infrastructure projects the local community was involved, especially parties who were felt to understand an area well. So, they will be able to play a role in 'maintaining' these public facilities. However, in general, the government as the person responsible for development in the region needs to think carefully, including coordinating with the provincial government and ministries as well as with parties who have the appropriate experience and resources so that the access of basic sanitation infrastructure which is a community right can be fulfilled.

3.2 Latrine Ownership and Maintenance

A clean environment is a reflection for every individual in maintaining physical health in everyday life. The clean and healthy living behavior program is one of the health promotion efforts that aims to ensure that everyone can live in a clean and healthy environment by creating conducive conditions for individuals, families, groups, and communities. This aims to increase knowledge, attitudes, and behavior to implement healthy ways of living to maintain, maintain, and improve health [17]. From the definition above, environmental sanitation aims to meet the requirements for a healthy and comfortable environment. An environment with poor sanitation can be a source of various diseases that can harm human health. In the end, if health is disturbed, then well-being will also decrease. A dynamic relationship between humans and their environment can be seen from how humans live together, side by side with all the components around them [18].

Table 2. Toilet Observation in Jayapura and Central Mamberamo District

Toilet Observation	Jayapura		Mamberamo	
	n	%	n	%
Toilet Type				
Permanent	15	53.1	70	38.9
Semi Permanent	83	28.8	61	33.9
Non permanent	52	18.0	49	27.2
Is it functional?				
Yes	27	95,8	162	90
No	12	4.16	18	10
Have doors				
Yes	27	95.4	154	85.6
No	13	4.51	26	14.4
Good lighting				
Yes	21	74.3	55	30.6
No	74	25.6	125	69.4
Good air circulation				

Toilet Observation	Jayapura		Mamberamo	
	n	%	n	%
Yes	25	87.1	131	72.8
No	37	12.8	49	27.2
Latrine type				
Pit latrine without slab	20	6.94	0	0
Pit latrine	20	72.5	180	100
Hanging latrine	59	20.4	0	0
Is there a sewage system				
Yes	28	100	117	65.0
No	0	0	63	35.0
Type of septic tank				
Unplastered hole	14	4.86	16	8.9
Plastered hole	19	68.4	141	78.3
Profile tank	20	6.94	23	12.8
Without any containment	57	19.7	0	0
Proximity to clean water source				
Less than 10 meters	13	48.2	45	25
More than 10 meters	14	51.7	135	75
Is there water available				
Yes	26	90.6	175	97.2
No	27	9.4	5	2.8
Hygiene				
Bad	61	21.1	8	3.4
Average	18	64.2	165	71.7
Good	42	14.5	59	25.4
Total	288	100	180	100

Based on the observations, toilet conditions both in Jayapura and Central Mamberamo Districts were generally in average condition, 64.2% and 71.7%, respectively. Most of them were permanently constructed with access to good lighting and air circulation. Most toilets in both districts (68.4% and 78.3%) used pit latrines with plastered holes to prevent pollution. People in Central Mamberamo Districts were able to keep the septic tanks' proximity to clean water source further compared to those who live in Jayapura District. However, we also found some cases where toilets were not built according to standards. There were some examples where toilets were built without any containment for the waste or, in some cases, according to our observation in the district, the waste was directly thrown into the lake. Studies have demonstrated that the management of solid and liquid human waste in Papua remains inadequate[19].



Fig. 1. Toilet without a sewage system

The government has also provided some public toilets in several areas in Jayapura and Central Mamberamo Districts. However, some of them were not used or damaged due to lack of maintenance. According to the local authorities, those toilets were neglected because there was no access to the water supply. An additional challenge hindering the utilization of public toilets could be attributed to the fact that they do not align with the cultural preferences of the local population. Results obtained from interviews and observations reveal differences in cultural preferences concerning the placement of toilet facilities. Native Papuan residents expressed a preference for separate latrines, distinct from their main houses, as having toilet inside the house was considered inadvisable. Conversely, in-migrants, individuals originating from other Indonesian provinces who have settled in Papua often have their latrines integrated within their residential structures. This tendency is particularly prominent when they reside in certain housing loan schemes (*Kredit Perumahan Rakyat/KPR* or *Rumah BTN*).



Fig. 2. Government Provided Public Toilet, Operational and Neglected

3.3 Perception of Illness Related to Open Defecation

The perception of illness related to open defecation varies, but it commonly involves an awareness of the significant health risks associated with this practice. Individuals and communities often understand that open defecation can lead to the contamination of water sources, the spread of waterborne diseases, and gastrointestinal illnesses like diarrhoea. Communities may collectively recognize the health hazards and work to address them, often motivated by fear of stigma or social exclusion associated with practicing open defecation. Cultural norms and access to information also shape these perceptions, with education efforts contributing to a greater understanding of the health risks associated with open defecation and motivating the adoption of safer sanitation practices.

Table 3. Perception of Illness Related to Open Defecation

Variables	Jayapura		Mamberamo	
	n	%	n	%
Open Defecation can cause dhiarrea				
Strongly disagree	15	41.7	27	11.6
Disagree	82	22.3	58	25.0
Neutral	23	5.7	40	17.2
Agree	58	15.8	97	41.8
Strongly Agree	51	14.4	10	4.3
Open Defecation can spread other diseases				
Strongly disagree	8	2.2	4	1.7
Disagree	15	4.1	19	8.2
Neutral	25	6.8	33	14.2
Agree	15	42.7	143	61.6
Strongly Agree	16	45.0	33	14.2
Defecating in nature is more comfortable				
Strongly disagree	160	43.6	39	16.8
Disagree	124	33.8	127	54.3
Neutral	40	10.9	28	12.1
Agree	12	3.3	22	9.5
Strongly Agree	31	8.4	16	7.3
Human feces can become a fertilizer for plants				
Strongly disagree	98	26.7	41	17.7
Disagree	154	42.0	116	49.6
Neutral	63	17.2	34	14.7
Agree	48	13.1	33	14.2
Strongly Agree	4	1.1	8	3.8
Toilet waste containment can contaminate clean water				
Strongly disagree	17	4.6	2	0.9
Disagree	65	17.7	31	13.4

Variables	Jayapura		Mamberamo	
	n	%	n	%
Neutral	77	21.0	48	20.7
Agree	144	39.2	121	52.2
Strongly Agree	64	17.4	30	12.9
Total	367	100	232	100

Respondents' perceptions regarding the use of toilets that defecation does not lead to diarrhea had conflicting answers, where Jayapura respondents answered strongly disagree 153 (41.7%) while most Mamberamo respondents answered agree 97 (41.8%). The perception that defecating can cause people to contract diseases is mostly agreed by respondents in this research. Nearly all respondents disagreed that defecating openly is more comfortable 160 (43.6%). Respondents did not agree that human waste could be used as soil fertilizer 154 (52%) and had the perception that toilet waste containment could not contaminate clean water. The table below summarizes how to improve existing support and reduce obstacles in the community in two districts to achieve open defecation-free in their area.

3.4 Supports and Challenges

Table 4. Support and Challenges to Achieve Open Defecation Free

Supports	Challenges
<ul style="list-style-type: none"> • Community Engagement and Education: <ul style="list-style-type: none"> ○ Raise awareness about the health risks associated with open defecation. ○ Educate communities about the benefits of proper sanitation and hygiene. ○ Promote behavioural change through targeted health campaigns. • Access to Sanitation Facilities: <ul style="list-style-type: none"> ○ Improve access to clean and functional toilet facilities. ○ Construct public and household toilets that are culturally appropriate. • Government Support: <ul style="list-style-type: none"> ○ Implement policies and regulations that prioritize sanitation infrastructure. 	<ul style="list-style-type: none"> • Limited Resources: <ul style="list-style-type: none"> ○ Lack of funding for sanitation projects and infrastructure. ○ Need more resources for education and awareness campaigns. • Cultural Beliefs and Practices: <ul style="list-style-type: none"> ○ Deep-rooted cultural norms and practices that may not prioritize proper sanitation. ○ Resistance to adopting new sanitation behaviors due to cultural beliefs. • Geographical Challenges: <ul style="list-style-type: none"> ○ Difficult terrain and remote locations make infrastructure development challenging. ○ Need for adequate access to water sources for maintaining sanitation facilities. • Healthcare Access and Awareness:

<ul style="list-style-type: none"> ○ Allocate funds for sanitation initiatives and programs. ● Collaboration with NGOs and Organizations: <ul style="list-style-type: none"> ○ Partner with non-governmental organizations and international agencies to provide resources and expertise. ○ Mobilize support for sanitation projects at local and national levels. ● Technology and Innovation: <ul style="list-style-type: none"> ○ Introduce innovative sanitation solutions suitable for local conditions. ○ Use technology for monitoring and maintaining sanitation facilities. 	<ul style="list-style-type: none"> ○ Limited healthcare facilities to address sanitation-related health issues. ○ Lack of awareness about the direct link between open defecation and health problems. ● Government Capacity and Implementation: <ul style="list-style-type: none"> ○ Weak enforcement of sanitation regulations and policies. ○ Limited capacity to implement and monitor sanitation programs effectively. ● Education and Literacy: <ul style="list-style-type: none"> ○ Low levels of education and literacy hinder the understanding of sanitation benefits. ○ Difficulty in conveying health-related information to communities with limited education.
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Tackling the above-mentioned obstacles and enhancing the supports through comprehensive strategy that engages government bodies, local communities, non-governmental organisations (NGOs), and international collaborators is vital to attain open defecation free status in central Mamberamo and Jayapura districts.

4 DISCUSSION

Promoting latrine ownership is a fundamental strategy in the broader context of efforts to enhance sanitation and achieve Open Defecation-Free status [20], [21], [22]. Communities and governments should work together to ensure that every household has access to sanitary latrine facilities, which, in turn contribute to better overall sanitation and public health outcomes. One important finding from this research to highlight is the issue of access to clean water source. Access to clean water is closely linked to proper sanitation and hygiene practices, in this context especially to the practice of stop open defecation.

It should be acknowledged that various efforts have been made by governmental and non-governmental bodies to achieve open defecation-free in Central Mamberamo and Jayapura districts. Local, provincial, and national government continue to implement steps and policies related to drinking water and sanitation. A case in point is the effort of local government in Central Mamberamo district that had started to build pipe installations to distribute clean water. However, there was a problem where the

community was damaging the pipe flow. The lesson was that it would be better if in the process of working on building large-scale projects, such as latrines and pipe installations, the community was involved and listened. Therefore, the community would experience a strong sense of belonging of the pipeline and latrines. In addition, engaging local communities, who have a deep understanding of their own area, can significantly contribute to the long-term sustainability of public facilities. Their active participation can help safeguard water supply system, ensuring their continued functionality.

Local government's efforts to address these issues seem to require more effective coordination with both native residents and in-migrants in the area. This present study found that there were disparities in private toilet ownership between native residents and immigrants, influenced by land ownership patterns. Hence, in the event of public awareness campaigns aimed at educating communities about the health hazards linked to open defecation and the significance of good sanitation practices, it is advisable for these campaigns to encompass both native inhabitants and in-migrants, considering differences in cultural preferences regarding toilet facilities' placement.

Another finding in this study is how the perception of illness related to open defecation plays a pivotal role in motivating behavioural change. While this perception was varied among respondents in this research, a common awareness exists regarding the substantial health risks associated with open defecation. Personal experiences or witnessing others suffering from waterborne or gastrointestinal illnesses often serve as catalysts for this awareness. Parents and caregivers are especially express their concern about children's vulnerability to disease due to open defecation, given their heightened susceptibility to waterborne diseases [23],[24]. Fear about being socially stigmatized or excluded due to engaging in open defecation also serve as a driving force for the respondents in this study to adopt appropriate latrine usage.

This study shows that cultural norms and access to information are influential factors shaping respondents' perceptions regarding open defecation habits. Educational efforts play a significant role in increasing awareness of health risks linked to open defecation and encouraging the adoption of good sanitation practices. Thus, it is evident that addressing the perceptions and behaviours surrounding open defecation is essential to fostering collective commitment to improved sanitation and most importantly to attain Central Mamberamo and Jayapura district as open defecation-free districts.

5 CONCLUSION

The journey toward improved sanitation and open-defecation free status in Central Mamberamo and Jayapura districts necessitates a holistic and collaborative approach. Several recommendations to enhance sanitation and achieve ODF status in those areas including (i) launch comprehensive public awareness campaigns targeting native residents and in-migrants, considering cultural differences in toilet placement; (ii) Prioritize efforts to improve water availability, especially in rain dependent regions, through exploring alternative water sources and involving the local community in infrastructure development; (iii) Ensure the maintenance and functionality of public toilets by implementing sustainable water supply solutions. By addressing these issues collaboratively,

progress can be made in reducing open defecation and promoting better sanitation practices in Papua.

Author's Contribution

All authors conceived of the idea and participated in the design of this study. AK conducted the study. REK and KK were responsible for the interpretation of the results. All authors drafting and reviewing manuscript.

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